A SUR-EC-AR System Gravity Model of Trade

by

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Abstract

This paper proposes a system of equations for modelling the volume of bilateral trade in multiple goods for a given set of countries. We postulate a gravity equation for each traded good rather than for the aggregate volume of bilateral trade. Special features of the system are the possibility of correlated explanatory variables, presence of panel data effects and autocorrelated disturbances. The correlated explanatory variables could be either correlated with the specific effects only or correlated with both the specific effects and the residual errors. Proper ways of specifying and estimating a model incorporating all the above characteristics are discussed and tests are suggested to verify some of the assumptions.

Keywords: bilateral trade, gravity model, panel data models, instrumental variables, autocorrelated errors

JEL Classification Codes: C33, F1

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1 Introduction

According to Anderson (1979), the gravity model is probably “the most successful empirical trade device of the last twenty years”. Even as these models were being successfully estimated, economists were keen to provide a theoretical foundation to the empirical model. We now have not one but several explanations: both economic and “non-economic”. Among the justifications based on formal economic theory, one can cite Anderson (1979), Bergstrand (1985,1989) and Deardoff (1995), Helpman (1987), Helpman and Krugman (1985).

Beginning with Poyhonen (1963) and Tinbergen (1962), gravity models have been estimated and analysed for different data sets (cf. for instance Wang and Winters (1991), Hamilton and Winters (1992), Baldwin (1994), Gros and Ganciarz (1996), Breuss and Egger (1999)). Most of these studies have estimated the model for the total volume of bilateral trade. However gravity equations can be specified for each of the goods traded as done by Bergstand (1989) in his theoretical derivation. In this case, we have a system of equations that can be treated as a SUR model. When panel data are used in the estimation of such models, specific effects can be further introduced into the system along the lines of Matyas (1997) (where the country specific effects are added as two separate terms for the importing and exporting countries) or Egger and Pfaffermayr (2000) (who insert *bilateral* interaction effect terms). Then come the additional issues of the regressors being correlated with the specific effects and the residual disturbances being serially correlated.

This paper attempts to combine all these extensions proposing what we call a SUR-EC-AR formulation and discusses estimation methods and tests for such a model. The following section reviews the economic theory of gravity models concentrating on the important aspects that give rise to the econometric specification that we adopt. The next section presents the econometric model, derives the variance covariance structure of the overall errors taking into account the presence of specific effects and autocorrelation and dwells in some length on the appropriate transformation that gets rid of the serial correlation bringing us back to a classical error component framework. Then we go on to discuss the endogeneity issues and the corresponding estimation methods and tests. Finally we conclude with some remarks on the planned application of our model to Yugoslavian trade data.

2 Theoretical Background

Anderson (1979) derives the gravity model using a trade-share-expenditure system which postulates identical Cobb-Douglas (or CES) preference functions for all countries, and utility functions weakly separable between traded and non-traded goods. In this case utility maximisation under the income constraint produces traded goods shares that are functions of traded goods prices only. Prices being constant in cross-sections, using the share relationships along with trade (im)balance identity, country j's imports of country i's good are obtained and assuming log-linear functions in income and population for shares, one obtains the gravity equation for aggregate imports.

Besides taking a close look at the identification issues of how to retrieve the structural parameters from the estimated equations, the author also notes the problem of endogeneity of income for which he proposes two alternate solutions. Both follow the Instrumental Variable (IV) approach, employing different instruments: one uses the lagged value of income as instruments and the other uses first stage estimations of shares by OLS and substitutes income values obtained from estimated shares for a second stage reestimation of the gravity equation. We will come back to the endogeneity issue later on in the section on estimation methodology. In the case of many goods, the aggregate gravity equation is obtained only by substituting a weighted average for the actual shares (in the second stage). Though this induces a bias the author argues that it is more than offset by the efficiency gain of increased observations.

Subsequent to Anderson (1979) whose theoretical analysis was at the aggregate level, Bergstrand (1985,1989) gave a microeconomic foundation to the gravity model within the framework of a general equilibrium model of world trade. The utility maximising consumers are assumed to have a CES preference function and profit maximising firms a CET production technology and the analysis produces import demand and export supply equations which along with the equilibrium condition, lead to reduced form equations for quantities (exports/imports) and prices. However since the reduced form eliminates all endogenous variables out of the explanatory part of each equation, income and prices also cease to be explanatory variables of bilateral trade. Thus instead of substituting out all the endogenous variables, the author solves the general equilibrium system only partially retaining income and certain price terms as explanatory variables and treating them as exogenous. The resulting model is termed as a "generalised" gravity equation and estimated for 15 countries at different points in time. Here the potential endogeneity of income (and prices) is not touched upon though it can be tackled once again by using IV techniques instead of OLS that the author employs.

Deardoff (1995) also offers a theoretical derivation of the gravity equation even within the framework of the Heckscher-Ohlin model in two cases. First with frictionless trade and identical preferences, where random choice of trading partners by consumers and producers is assumed and second with trade impediments assuming unequal factor prices. He shows that "First, it is not at all that difficult to justify even simple forms of the gravity equation from standard theories. Second, because the gravity equation appears to characterise a large class of models, its use to test any of them is suspect".

Let us now turn briefly to the non-economic so-called social physics[2] explanations of gravity model. This school of thought formulates a trade model using concepts analogous to those in physics calling it the gravity model. Similarly to the gravitational force between two masses which is directly proportional to the masses and inversely proportional to the distance between them, Stewart (1948) postulates that migration between two towns is directly proportional to their populations and inversely to the distance between the two. In the field of trade, Poyhonen (1963) and Tinbergen (1962) were the first major initiators of gravity formulas. Poyhonen (1963) used national income or national income per capita for the "mass" concept and cost of transport as a measure of distance. Some other variables like market areas were also controlled for. Tinbergen's (1962) model included dummies for neighbouring countries and membership to a preferential trade area.

Linnemann (1966), a member of Tinbergen's team, tried to combine the "physics" approach and economic theory by placing the model in an H-O framework where comparative advantages determine trade. Instead of differences in factor endowments being the driving force behind comparative advantages, economies of scale and technology differences are the explanatory factors of this advantage. According to Linnemann (1966) potential

[2]term used in Olsen (1971) for instance

trade is dependent on differences in population size with trade being negatively correlated with size. Finally, trade resistance like transportation costs as well as tariffs, quotas and preferential trade agreements also influence the volume of trade.

At this point we would like to refer the reader to Olsen (1971), Helpman and Krugman (1985), Helpman (1987), Leamer and Levinsohn (1995) for excellent accounts of international trade theory.

Parallel to the search for a solid theoretical foundation for the gravity model, researchers have also examined the econometric issue of what is the correct way of specifying and estimating a gravity equation. Matyas (1997) argues that the proper specification of gravity model takes the following representation:

$$T_{ijt} = \alpha_i + \gamma_j + \lambda_t + \beta' x_{ijt} + \delta' z_{ij} + u_{ijt} \tag{1}$$

where α_i, γ_j and λ_t are the well-known specific effects attributed to the panel data modelling approach. If only cross section data are used, $\lambda_t = 0$ and when only time series data are used, $\alpha_i = \gamma_j = 0$. When panel data are used, there are no restrictions. The author then goes on to show how the specific effects turn out to be significant in empirical analysis. While Matyas (1997) does not favour any of the two possible assumptions on the specific effects (fixed effects or random effects), Egger (2000) shows, using a similar panel specification that REM is strongly rejected in favour of FEM by a Hausman specification test. More recently Egger (2001) demonstrates that due to the possible correlation of individual effects with the explanatory variables and due to an AR(1) pattern of the errors, a Hausman-Taylor (1981) model is the correct answer to the specification question. Here the specific effects are represented by an interaction term μ_{ij} rather than $\alpha_i + \gamma_j$ as in Matyas (1997) or Egger (2000). Thus Egger (2001) argues that huge trade potentials observed in other empirical studies such as Baldwin (1994), Wang-Winters (1991), Hamilton-Winters (1992), Gros-Ganciarz (1996) are in fact the result of an econometrically misspecified model.

Almost all the studies using panel data models for bilateral trade volume have only considered the case where the random individual (bilateral) effects are possibly correlated with the regressors thus advocating a fixed effects approach. However, as we have seen in the theoretical explanations of gravity models, all the authors admit that income and prices are endogenous (even in the absence of specific effects in the model) and thus need to be instrumented. This point is somehow not fully emphasized in the empirical studies and we would like to point it out here. Not only does it imply that income has to be instrumented (which it will be anyway due to its correlation with individual effects) but more importantly that lagged income is not a valid instrument in the model as such, in case the residual errors are supposed to be AR(1) as advocated by Egger (2001). Furthermore, Anderson's (1979) suggestion of running a first stage OLS on the gravity equation to estimate shares which are in turn used as instruments in a second stage, cannot be valid as OLS will produce biased estimates in this case. Hence IV or GMM approach (with out-of-the-equation instruments if AR(1) errors) is the appropriate one for the gravity equation even in the first stage estimation once we treat income to be endogenous. In fact income can be termed to be "doubly endogenous" (expression similar to the terminology of single/double exogeneity of Cornwell, Schmidt and Wyhowski (1992)), being correlated with both the specific effects and the residual error terms, whereas the other explanatory variables are singly endogenous being correlated with the specific effects only. The next sections deal in greater length on the different possible sets of assumptions and the corresponding estimation methods and tests.

3 The Econometric Model

We are interested in estimating a relationship of the form

$$y_{ijt} = \beta' x_{ijt} + \gamma' z_{ij} + \mu_{ij} + \nu_{ijt} \qquad (2)$$

where we have modelled the individual effect as a bilateral effect along the lines of Egger and Pfaffermayr (2000). In this equation y_{ijt} represents the bilateral trade volume between countries i and j. In general the equation is written for a set of countries over time constituting a panel data model with fixed/random effects. Among the x_{ijt}'s one would find, the income (GDP) of both the countries i and j, populations of i and j, export and import prices, the similarity or relative size factor and the relative factor endowments. Among these explanatory variables, the two incomes, the relative size factor and the relative factor endowments can be considered to be possibly (doubly) endogenous. The constant term, the distance between the two countries, the common border dummy and the free trade zone dummy are part of the z_{ij} variables among which distance is potentially (singly) endogenous (correlated only with the specific effects). Time effects λ_t an be added to the equation if necessary but we will omit them in our presentation.

As noted by Egger (2001) trade series residuals are found to exhibit serial correlation which can be accounted for by specifying an AR(1) structure for ν_{ijt} i.e. by postulating that

$\nu_{ijt} = \rho\nu_{ij,t-1} + \omega_{ijt}$

with ρ less than 1 in absolute value and with $\omega_{ijt} \sim iid(0, \sigma_\omega^2)$. This gives an error component model with AR(1) disturbances which has been analysed by Baltagi and Li (1991) in which the authors propose a transformation to get back to a classical error component structure, enabling GLS estimation of the transformed model.

In this section we are going to extend this basic EC-AR(1) model in different directions. First, by having a separate gravity equation for each of M goods we are going to have a system of equations with EC errors and AR(1) disturbances. Though SUR with EC already exists in the literature (see Avery (1977) and Baltagi (1980)) and so does EC with AR(1) (Lillard and Willis (1978), Baltagi and Li (1991)), we have not encountered the combination of all the three. We will see below that this generalisation is not all that straightforward and care needs to be taken in finding the appropriate transformations and instruments eventually requiring some additional assumptions. The possibility of non-zero correlation between the regressors and the specific effects on one hand and between the regressors and the disturbances on the other hand makes it a system of error components regressions with some endogenous regressors necessitating estimation by generalised IV methods. Further, the presence of autocorrelation in the disturbances is an extra complication and plays a role in deciding the appropriate instruments. Let us examine these extensions in steps.

First let us consider the multivariate system. As noted in Bergstand (1989) the gravity equation can be written for each good traded and if we do so then we obtain a SUR model. Thus a multivariate system is the appropriate model for explaining bilateral trade flows in several goods. We have to introduce some notations at this stage. Let us write the gravity equation for each good m as follows:

$$y_{mijt} = \beta' x_{mijt} + \gamma' z_{mij} + \mu_{mij} + \nu_{mijt} \tag{3}$$

with μ_{mij} representing the specific bilateral effect for good m traded between countries i and j and ν_{mijt} following an AR(1) structure :

$$\nu_{mijt} = \rho_m \nu_{mij,t-1} + \omega_{mijt} \tag{4}$$

We assume that

$$\begin{aligned} E(\mu_{mij}\mu_{kij}) &= \sigma_{\mu mk} \quad \forall \quad i,j \\ E(\mu_{mij}\mu_{ki'j'}) &= 0 \quad for \quad i \neq i' \quad and/or \quad j \neq j' \end{aligned}$$

The contents of the different variables are the same as before except for the prices which will now be those of the good in question and may be of certain relevant substitutes and/or complements.

It is important to note that we differentiate the autocorrelation coefficient across equations. Regrouping the ω_{mijt}'s for all the goods in a vector ω_{ijt} and assuming that $\omega_{ijt} \sim iid(0, \Sigma_\omega)\ \forall i, j, t$, it is easily verified that (Parks (1967) derived it in the multivariate setting with only time series observations):

$$E(\nu_{mijt}\nu_{kijs}) = \begin{cases} \frac{1}{1-\rho_m\rho_k}\sigma_{\omega mk} & for \quad t = s \\ \frac{1}{1-\rho_m\rho_k}\rho_m^{t-s}\sigma_{\omega_m k} & for \quad t > s \\ \frac{1}{1-\rho_m\rho_k}\rho_k^{s-t}\sigma_{\omega mk} & for \quad s > t \end{cases} \tag{5}$$

$$E(\nu_{mijt}\nu_{ki'j's}) = 0 \quad for \quad i \neq i' \quad and/or \quad j \neq j' \tag{6}$$

Now if we denote by ν_m and ν_k the vectors of specific effects for observations over all pairs of countries (say N) and all time periods (T) for equations m and k respectively then we have:

$$\begin{aligned} E(\nu_m\nu_k') &= \sigma_{\omega mk} I_N \otimes \frac{1}{1-\rho_m\rho_k} \begin{bmatrix} 1 & \rho_k & \rho_k^2 & \dots & \rho_k^{T-1} \\ \rho_m & 1 & \rho_k & \dots & \rho_k^{T-2} \\ \vdots & & & & \\ \rho_m^{T-1} & \rho_m^{T-2} & \dots & \rho_m & 1 \end{bmatrix} \\ &\equiv \sigma_{\omega mk}(I_N \otimes \Omega_{\nu mk}) \end{aligned} \tag{7}$$

calling the matrix on the RHS of $\otimes$ (along with the factor in front) $\Omega_{\nu mk}$.

By writing $\varepsilon_m = (I_N \otimes \iota_T)\mu_m + \nu_m$ we can write

$$E(\varepsilon_m \varepsilon_k') = \sigma_{\mu mk}(I_N \otimes \iota_T \iota_T') + (I_N \otimes \tilde{\Omega}_{\nu mk}) \tag{8}$$

and

$$E(\varepsilon\varepsilon') = (I_M \otimes I_N \otimes \iota_T)\Sigma_\mu(I_M \otimes I_N \otimes \iota_T') + \tilde{\Omega}_\nu \tag{9}$$

Recall that in the single equation EC-AR(1) Baltagi and Li (1991) use the transformation $I_N \otimes C$ with C such that $C'C = \Omega_\nu$ and $C\Omega_\nu C' = I_T$ to bring the equation to the classical error component framework (with a slight change in the first element of ι_T that is taken care of appropriately). In our case, since the autocorrelation coefficient is different for each equation, each equation will have to be transformed by a different matrix. Let C_m^* be such that $C_m^{*'} C_m^* = \tilde{\Omega}_{\nu mm}$; C_m^* is given by

$$C_m^* = \begin{bmatrix} (1-\rho_m^2)^{\frac{1}{2}} & 0 & \dots & 0 \\ -\rho_m & 1 & \dots & 0 \\ \vdots & & & \\ 0 & 0\dots & -\rho_m & 1 \end{bmatrix} \tag{10}$$

and $C_m^* \Omega_{\nu mm} C_m^{*'} = \sigma_{\omega mm} I_T$. Thus the transformation for the whole system is:

$$\tilde{\varepsilon} = \begin{bmatrix} (I_N \otimes C_1^*)\varepsilon_1 \\ (I_N \otimes C_2^*)\varepsilon_2 \\ \vdots \\ (I_N \otimes C_M^*)\varepsilon_M \end{bmatrix} \tag{11}$$

However if we choose this transformation then we have $C_m^* \Omega_{\nu mk} C_k^{*'} \neq \sigma_{\omega mk} I_T$ for $m \neq k$. In fact we obtain

$$C_m^* \Omega_{\nu mk} C_k^{*'} = \sigma_{\omega mk} \begin{bmatrix} \frac{\sqrt{((1-\rho_m^2)(1-\rho_k^2))}}{(1-\rho_m\rho_k)} & 0 \\ 0 & I_{T-1} \end{bmatrix}$$

There are several alternative ways of tackling this issue. The simplest one is use C_m instead of C_m^*, obtained by removing the first column and row of C_m^*. This is equivalent to using the Cochrane-Orcutt type transformation rather that the Prais-Winsten type. C_m is given by

$$C_m = \begin{bmatrix} -\rho_m & 1 & 0 & \dots & 0 \\ 0 & -\rho_m & 1 & \dots & 0 \\ \vdots & & & & \\ 0 & 0 & \dots & -\rho_m & 1 \end{bmatrix} \quad (12)$$

thereby obtaining

$$E(\tilde{\varepsilon}_m \tilde{\varepsilon}'_k) = \sigma_{\mu mk}(1-\rho_m)(1-\rho_k)(I_N \otimes \iota_{T-1}\iota'_{T-1}) + \sigma_{\omega mk}(I_N \otimes I_{T-1}) \quad (13)$$

Denoting $\tilde{\sigma}_{\mu mk} = \sigma_{\mu mk}(1-\rho_m)(1-\rho_k)$ leads to

$$V(\tilde{\varepsilon}) = \tilde{\Sigma}_\mu \otimes (I_N \otimes \iota_{T-1}\iota'_{T-1}) + (\Sigma_\omega \otimes I_{N,T-1}) \quad (14)$$

This will easily lead to the spectral decomposition of the variance covariance matrix of the transformed errors thus bringing us to a classical SUR-EC framework. Therefore one can apply GLS to estimate the transformed model which is actually the following quasi-difference model:

$$y_{mijt} - \rho_m y_{mij,t-1} = \beta'(x_{mijt} - \rho_m x_{mij,t-1}) + (1-\rho_m)\mu_{mij} + \omega_{mijt} \quad (15)$$

Now, this solution may not be satisfactory when T is small as leaving the first (transformed) observation may produce significant bias in the results (Griliches and Rao (1969) showed it in the single equation AR model with time series only). So, one might want to keep the first observation. In this case we propose two alternatives. The first one, based on Parks (1967), consists in changing the $(1,1)$ element of C^*_m as $(1-\rho^2_m)^{-\frac{1}{2}}$ and assuming a different variance for the first period disturbance as follows:

$$E(\nu_{mij1}\nu_{kij1}) = \sigma_{\omega mk}\frac{\sqrt{(1-\rho^2_m)(1-\rho^2_k)}}{(1-\rho_m\rho_k)} \quad m,k = 1,...M \quad (16)$$

With this additional assumption we ensure that

$$C^*_m \Omega_{\nu mk} C^{*'}_k = \sigma_{\omega mk} I_T \quad \text{for} \quad m \neq k.$$

Another way to handle the problem is to apply the transformation suggested by Judge, Griffiths, Hill, Lutkepohl and Lee (1985). Due to the presence of specific effects the transformation has to be appropriately extended. The extended matrix is given by

$$P = \begin{bmatrix} I_N \otimes P_{11} & 0 & \dots & 0 \\ I_N \otimes P_{21} & I_N \otimes P_{22} & \dots & 0 \\ \vdots & & & \\ I_N \otimes P_{M1} & I_N \otimes P_{M2} & \dots & I_N \otimes P_{MM} \end{bmatrix}$$

where the P matrices are defined as follows:

$$P_{mm} = \begin{bmatrix} \alpha_{mm} & 0 & 0 & \dots & 0 \\ -\rho_m & 1 & 0 & \dots & 0 \\ 0 & -\rho_m & 1 & \dots & 0 \\ \vdots & & & & \\ 0 & 0 & 0 \dots & -\rho_m & 1 \end{bmatrix}$$

$$P_{mk} = \begin{bmatrix} \alpha_{mk} & 0 & 0 & \dots & 0 \\ 0 & 0 & 0 & \dots & 0 \\ 0 & 0 & 0 & \dots & 0 \\ \vdots & & & & \\ 0 & 0 & 0 & \dots & 0 \end{bmatrix} \quad for \quad m \neq k$$

where α_{mk}'s are chosen such that $\Sigma = A\Sigma_0 A'$. A is the matrix of $\alpha_{mk}, m, k = 1, ...M$ and Σ_0 denotes the matrix of variance covariances of initial disturbances $\nu_{mij1}\nu_{kij1},\ m, k = 1, ...M$.

This is the most complicated option as the presence of individual specific effects makes the calculations extremely tedious to get back to the classical error component framework.

4 Estimation Methods and Tests

The previous section gave us the required transformation(s) to be able to get back to the classical EC framework for each equation of the system. Let us now consider the nature of the explanatory variables of the equations. From the economic theory presented in Section 2 we deduce that at least income should be endogenous. Hence let us assume in general that a subset of the explanatory variables can be endogenous. That is they are correlated with the residual disturbances. This is shall we say irrespective of whether they are also correlated with the specific effects or not. Hence we need to estimate the transformed system by instrumental variable methods. An appropriate instrument for income or GDP could be government expenditure.

One can apply either the generalised 2SLS (G2SLS) procedure developed by Krishnakumar (1988) and Balestra and Varadharajan-Krishnakumar (1987) for a SEM with EC or the EC2SLS of Baltagi (1981).

In order to make the above procedures feasible, one would need prior estimates of $\tilde{\Sigma}_\mu$ and Σ_ω. This also involves an estimation of each autocorrelation coefficient. For this we propose a first stage estimation of the model by instrumental within estimation on the system and make use of its residuals. Note that lagged income cannot be used as an instrument for income due to possible autocorrelation in the disturbances. Let us denote these residuals by $\hat{\varepsilon}_{ijt}$. Then the ρ's can be estimated as:

$$\hat{\rho}_m = \frac{\sum_t \hat{\varepsilon}_{mijt}\hat{\varepsilon}_{mij,t-1}}{\sum_t \hat{\varepsilon}^2_{mij,t-1}}, \qquad m = 1, ...M \tag{17}$$

These $\hat{\rho}$'s can be used to estimate the transformed model by error component (random effects) GLS on the whole system. Here again there is a first stage estimation of the system with AR(1) without the panel effects. Due to the endogeneity problem this should also be done by applying IV techniques on the transformed model. Then the residuals of this estimation can once again be used for estimating the variance components by say ANOVA formulae. Denoting these residuals as $\tilde{\varepsilon}_{mijt}$, we have

$$\begin{aligned} \hat{\sigma}_{\omega mk} &= \frac{1}{(N-1)(T-1)}\tilde{\varepsilon}'_m Q \tilde{\varepsilon}_k \\ \hat{\tilde{\sigma}}_{\mu mk} &= \frac{1}{(T-1)}\tilde{\varepsilon}'_m P \tilde{\varepsilon}_k \end{aligned}$$

where $P = \frac{1}{T}(I_N \otimes \iota_T \iota'_T)$ and $Q = I_{NT} - P$.

In the second and final stage the SUR-EC-AR model can be estimated by applying G2SLS to the transformed model.

Hausman tests can be performed for possible correlation of the explanatory variables with the errors by comparing the system G2SLS estimators with those of the system GLS estimators using a Wald statistic following an asymptotic χ^2 distribution.

In case we conclude that all the regressors are doubly exogenous then the instrumental methods can be replaced by within/OLS estimations in the first stages and feasible GLS in the second stages.

Another interesting test could be one of the presence of autocorrelation in the residual errors which can be done by means of Baltagi and Li (1995) or Baltagi and Wu (1999) type LM tests using the *IV-within* residuals of the very first stage of estimation. Since we have assumed a different autocorrelation parameter for each equation, this can be applied equation by equation at the corresponding implementation step.

A final test in this context is that of the equality of coefficients of the income (GDP) of both countries in the same equation as well as the equality of the coefficients of the populations of the two countries. This can be carried out by comparing the generalised residual sum of squares of the unconstrained and constrained estimations by means of the usual asymptotic χ^2 statistics suitably adapted to the IV context of our model.

5 Further work

We are in the process of implementing the model for estimating trade equations for Yugoslavian exports/imports of different categories of goods to major EU countries, CIS and former Yugoslavian Republics, including these equations in a system of gravity equations for all bilateral flows. We hope to have the results very soon as the implementation has been unexpectedly delayed due to problems in data collection and computational difficulties. These results will be added to the text as soon as they are available and will be included in the oral presentation at the conference.

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